

**DEPARTMENT OF THE ARMY  
U.S. ARMY CORPS OF ENGINEERS  
Washington, DC 20314-1000**

ER 1110-2-4401

CECW-EE

Regulation  
No. 1110-2-4401

30 May 1997

**Engineering and Design  
CLEARANCES FOR ELECTRIC POWER SUPPLY LINES  
AND COMMUNICATION LINES OVER RESERVOIRS**

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Report Documentation Page		
<b>Report Date</b> 30 May 1997	<b>Report Type</b> N/A	<b>Dates Covered (from... to)</b> -
<b>Title and Subtitle</b> Engineering and Design: Clearances for Electric Power Supply Lines and Communication Lines Over Reservoirs	<b>Contract Number</b>	
	<b>Grant Number</b>	
	<b>Program Element Number</b>	
<b>Author(s)</b>	<b>Project Number</b>	
	<b>Task Number</b>	
	<b>Work Unit Number</b>	
<b>Performing Organization Name(s) and Address(es)</b> Department of the Army U.S. Army Corps of Engineers Washington, DC 20314-1000	<b>Performing Organization Report Number</b>	
<b>Sponsoring/Monitoring Agency Name(s) and Address(es)</b>	<b>Sponsor/Monitor's Acronym(s)</b>	
	<b>Sponsor/Monitor's Report Number(s)</b>	
<b>Distribution/Availability Statement</b> Approved for public release, distribution unlimited		
<b>Supplementary Notes</b>		
<b>Abstract</b>		
<b>Subject Terms</b>		
<b>Report Classification</b> unclassified	<b>Classification of this page</b> unclassified	
<b>Classification of Abstract</b> unclassified	<b>Limitation of Abstract</b> UU	
<b>Number of Pages</b> 4		

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**1. Purpose**

This regulation defines the minimum vertical clearances to be provided when relocating or replacing existing or when constructing new power and communication lines over waters of reservoir projects. Definitions are provided in paragraph 5.

**2. Applicability**

This regulation applies to all USACE Commands having civil works responsibilities for reservoir projects.

**3. General**

This regulation applies to elevated power and communication lines within project boundaries regardless of whether the reservoir may or may not be classified as navigable. (Lines may be either buried, removed, rerouted, or elevated for compliance with this regulation.) Authority to grant rights-of-way for these lines is contained in 10 USC 2668. Federal regulatory policy and other matters, such as permitting policy, for power and communication lines crossing reservoirs are contained in 33 CFR 320-330.

**4. References**

- a.* 10 USC **2668**.
- b.* 33 CFR 320-330.
- c.* EM 385-1-1, Safety and Health Requirements Manual.
- d.* American National Standard ANSI C2, National Electrical Safety Code (NESC).
- e.* American National Standard ANSI/NFPA 70, National Electrical Code (NEC).

**5. Definitions**

- a. Reservoir.* The land and water areas of any water resource development project administered by the Chief of Engineers.
- b. Reference pool elevation.* The reservoir level that would be attained for routine storage of water for flood control and other authorized storage uses. This reservoir level corresponds to the "total design capacity" of the reservoir, excluding surcharge storage.

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This regulation supersedes ER 1110-2-4401, dated 5 September 1986.

*c. Low point of line.* The low point of the line shall be the least vertical clearance between a line and the earth's surface below it at final sag as outlined in Rule 232 of the NESC.

*d. Minimum vertical clearance.* The minimum vertical clearance shall be the distance from the reference pool elevation to the low point of the line. This minimum vertical clearance shall be based upon the "reference vessel height," as defined in paragraph 5h.

*e. Transmission lines.* Power lines having a nominal operating voltage of 69 kV and above.

*f. Primary distribution lines.* Power lines having a nominal operating voltage within the range of 750 volts to less than 69 kV.

*g. Secondary distribution lines.* Power lines having a nominal operating voltage of less than 750 volts.

*h. Reference vessel height.* The term, as used here, is the vessel's total height above the water including mast and all appurtenances. It is based upon a vessel height of 14,630 mm (48 ft), including mast, plus a 1,220-mm (4-ft) antenna or other appurtenances to the mast, and it shall replace each Water areas-sailboats Reference component of Rule 232 in Table A-2a of Appendix A of NESC.

## 6. Clearance Requirements

*a. Upstream lake areas.* Minimum vertical clearances over lake areas, where sailboats are commonly operated, shall be not less than the following:

(1) Power line clearances shall be calculated with 15,850 mm (52 ft) Reference Vessel Height substituted for Reference Components in NESC Table A-2a.

(2) Low voltage communication lines, as defined in Section 2 of the NESC, shall have a minimum vertical clearance of 15,850 mm (52 ft).

(3) Where feasible, primary and secondary distribution lines should be installed underground.

(4) Sailboat rigging and launching areas shall have clearances 1,524 mm (5 ft) greater than those given in paragraph 6a (1) and (2) above.

(5) In water areas where it is not reasonable or normal for sailboats to be rigged, launched, or operated, consideration will be given to installing power and communication lines with a minimum vertical clearance of not less than that required in the current edition of the NESC, Rule 232, Table 232-1, Item 6. NESC clearances shall be those above the reference pool elevation as defined above.

(6) If consideration is desired for installing lines in accordance with paragraph 6a (5) above, a request for consideration with justification must be submitted to CDR, USACE (CECW-EE), Washington, DC 20314-1000.

*b. Downstream/tailwaters.* In those areas where sailboating can reasonably be expected, minimum vertical clearances shall be as required in paragraph 6a (1) and (2). Clearances shall be measured from the minimum water level that makes sailboating infeasible, e.g. due to turbulence. In other areas where sailboating cannot reasonably be expected, minimum vertical clearances shall not be less than that required in paragraphs 6a (5) and (6). These clearances shall be provided above a maximum tailwater elevation based on discharges that can reasonably be anticipated during the life of the project.

*c. Service lines to public facilities.* Overhead secondary distribution lines serving marinas/concession facilities, to include boat docks, piers, etc., shall be installed parallel to and over the edge of walkways in accordance with the NEC. A minimum vertical clearance of 3,660 mm (12 ft) above the walkway shall be maintained. In other areas of the marina or public floating facility where a sailboat is physically prevented from entering the area the overhead secondary distribution line may be installed with a minimum vertical clearance of

3,660 mm ( 12 ft). A service disconnect switch for de-energizing these lines shall be provided and installed on a permanent structure where the base elevation is above the top of the reference pool elevation. The responsibility for de-energizing service lines prior to inundation of electrical

equipment and/or when the reference pool elevation is reached shall rest with the lessee. All overhead lines on public lands not susceptible to inundation shall have a minimum vertical clearance above ground in accordance with the NEC.

FOR THE COMMANDER:

A handwritten signature in black ink, appearing to read "Otis Williams". The signature is fluid and cursive, with the first name "Otis" and last name "Williams" clearly distinguishable.

OTIS WILLIAMS  
Colonel, Corps of Engineers  
Chief of Staff